

Surgical management of displaced calcaneum fractures by plating

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Abstract

Introduction: Calcaneal fractures are comparatively rare injuries, which occur in 2% of all fractures. According to the recent literature, 60% to 75% of these fractures are considered to be displaced and intraarticular, which evidences the difficulty of the treatment. This type of injury is more common in men compared to women because it commonly occurs as an occupation-associated injury.

Methodology: In this study of prospective design 40 patients with calcaneum fracture treated by ORIF with plates between JAN 2019 to DEC 2021 were reviewed at a tertiary centre. The patients were called for a final follow-up evaluation and the latest functional outcome assessed as for the AOFAS score and results were analysed.

Results: Young patients showed significantly better outcome with ORIF with plating. The timing of the surgery is the most important determinant for the outcome. The final functional outcome assessed with AOFAS score is encouraging with 77.1%.

Conclusion: Operatively treated calcaneum fractures with ORIF with plates gives a good functional outcome when surgical principles are strictly adhered to, proper patient selection, appropriate timing for surgery, strict asepsis, proper approach for raising full thickness flaps, accurate anatomic reduction and proper post-operative protocol with follow-up which minimizes complications.

Keywords: Calcaneum, fracture, ORIF, plate, AOFAS score

Introduction

Calcaneus fractures are the most common fracture of the tarsal bones, yet controversy still exists on the best treatment for these disabling injuries. However, as a better understanding of fracture patterns with computed tomography scans and modern surgical techniques and hardware has improved outcomes and lowered morbidity, a trend has developed toward open reduction and internal fixation (ORIF) for displaced, intra-articular calcaneus fractures. The extensile lateral approach has gained wide popularity for the surgical fixation of the intra-articular calcaneal fracture. It provides excellent exposure, allowing access to manipulate and fix the fracture fragments. Results from the extensile lateral approach can be rewarding, but

soft tissue complications can be serious. This applies particularly to open calcaneal fractures, smokers, or patients with diabetes. For this reason, there has been renewed interest in small-incision surgery for calcaneal fractures. This approach is not new. In 1982, McReynolds popularized the medial approach, with the results published by Burdeaux. In 1983, in a preliminary report, Stephenson described a combined lateral and medial approach for the treatment of displaced intra-articular calcaneus fractures. Calcaneus, the largest of the seven tarsal bones, acts like a strong lever to direct the body weight to the ground. Many approaches have been tried in the treatment of these historically important fractures and they have been changed over time. Although conservative treatment modalities were preferred previously, they have been replaced by surgical treatment options with the development in techniques.

Objective

Aims and objectives of the study

To evaluate the results of surgical treatment of calcaneum fractures, treated with plating with reference to:

1. Operative procedure and post op period.
2. Results of early mobilization.
3. Final functional outcome.

Materials and Methods

Source of data

The material for the present study is proposed to be collected from minimum of 40 patients attended at a tertiary centre, between JAN 2019 to DEC 2021.

Method of collection of data

- Data will be collected from patients who are attended in orthopaedics OPD and admitted in orthopaedics wards at a tertiary centre.
- Clinical study will be through questionnaires and clinical examination.
- All patients will undergo preoperative and post-operative x-ray investigations.
- Surgical management of the fracture.
- Post-operative observation of patients for any complications.
- Regular follow up and health education for the patients treated to study the Functional outcome.

Inclusion criteria

- Fresh fracture.
- Patients should be walking prior to the fracture.
- All patients above 18years of age with intra-articular calcaneum fractures.

Exclusion criteria

- Fracture in children.
- Grossly comminuted fractures.
- Severely osteoporotic bone.
- Open fractures.
- Pathological fractures.
- Calcaneal fractures with other associated fracture in lower limb.

Results

Patient demographics

The study population age ranged between 18-65 years. In terms of age groups, the respondents aged ≤20 years comprise 6.7% of the total, 21-30 years 13.3%, 31-40 years 43.3%, 41-50 years 20% and over 50 years 16.7%. The male to Female ratio was 5:1.

Table 1

Age	Frequency	Percentage
≤20 yrs.	2	6.7
21-30 yrs.	4	13.3
31-40 yrs.	13	43.3
41-50 yrs.	6	20
>50 yrs.	5	16.7

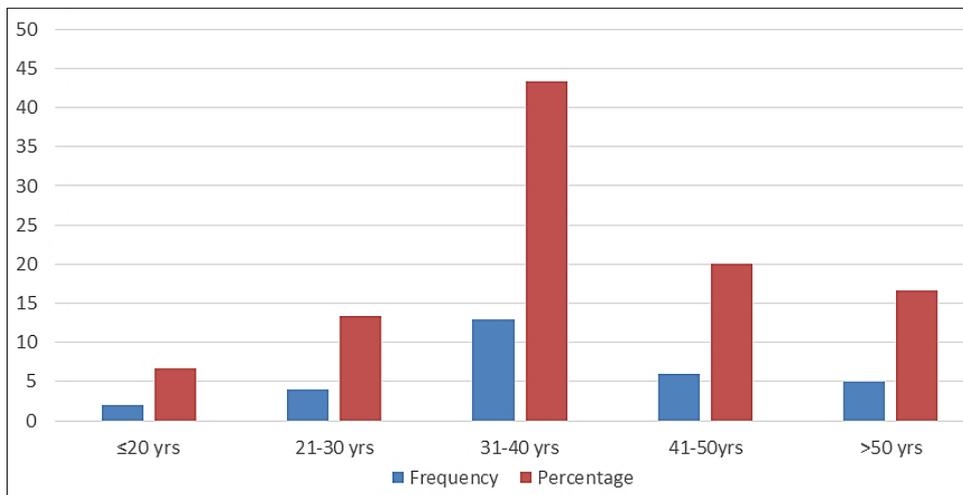


Fig 1: Age distribution

Table 2: Gender distribution of patients studied

Sex	Frequency	Percentage
Male	27	90
Female	3	10
Total	30	100

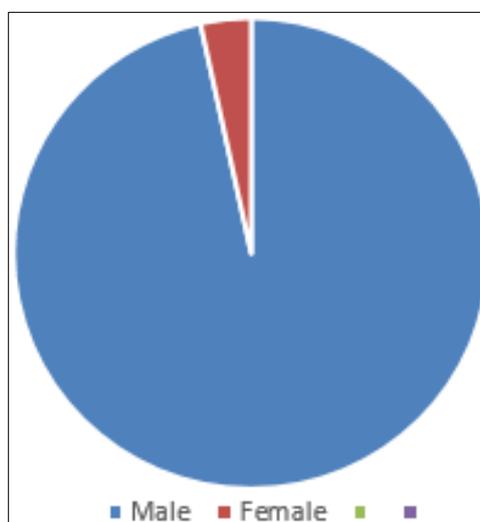


Fig 1: Sex distribution

Discussion

For the treatment of calcaneal fractures, there have been many options from conservative to open surgical techniques. In literature, the first conservative treatment choice technique of these fractures, suggested by Herman, was the disimpaction, in which the deformity was corrected under general anesthesia by hitting the lateral surface of calcaneus with a wooden hammer after placing a towel on the skin ^[4]. Herman's aim was to achieve the original height of the calcaneal bone. He believed that this technique would restore the functions of the heel and back of the foot. The studies that assess the use of conservative treatment showed that these patients may have had pain after prolonged physical activity even if they can go back to work after treatment. Walking analyses performed on these patients also support this result ^[5, 6]. However, when the conservative treatment is compared to surgical options, there was no statistically significant difference between them. In another study that gave priority to conservative treatment, in patients who had segmental fractures that cannot be treated conservatively, they tried conservative treatment first. Subsequently, corrective osteotomy and arthrodesis were performed to treat the remaining complaints. When the results were evaluated, it was well understood that earlier surgery, which was performed before the malunion developed, had given better results. The use of grafts is another contradictory topic on the treatment of these fractures. Studies show that patients in whom grafts were involved gave better and more satisfactory results with earlier full weight bearing than without using graft. Minimally invasive and fixation by screw onto the percutaneous cannula techniques were tried to avoid complications such as corner necrosis, infections, and osteomyelitis arising from surgical treatment of calcaneus fractures, and they gave satisfactory results. However, it was stated that these treatment modalities could only be used in moderate fractures in which the conservative treatment would not be insufficient and the open surgery would be too invasive because displaced fractures with many segments cannot be reduced externally. Sanders classification is a system that is frequently used in calcaneal fractures and it also predicts the prognosis. Type I fractures often give more satisfactory results, the other high grade types of fracture result have more unfavorable outcomes. Therefore, some authors defend the idea that surgical techniques should only be used in moderate-class fractures (i.e., excluding types 1 and 4). When kinematic data of the feet and ankles were assessed after conservative and surgical treatment of calcaneal fractures, there was no statistically significant difference between healthy and fractured extremities in both groups. In another study evaluating cost effectiveness of these two options, it was observed that surgical treatment of these fractures is both more effective and cheaper than conservative treatment methods. In accordance with the developments in surgical techniques and biomechanics, nowadays, surgical treatment is usually the first choice in calcaneus fractures.

In literature, the aims of the surgical treatment are defined as follows:

1. Reducing the posterior facet joint.
2. Providing original height and width of calcaneus.
3. Achieving fibular tendon mobility.
4. Regaining the valgus position of tuber calcanei.
5. Reducing the calcaneo-cuboidal joint.

The authors who support the open reduction and internal fixation in recent studies emphasize that cases that are treated surgically have more positive feedbacks, that the patients in which the surgery is chosen as the first treatment option have better outcomes, and that these patients have higher long term quality of life.

Summary

The total number of cases of fracture of the calcaneum in this prospective study are 30, of which 27 were male and 3 females. The age group of the patients is between 18 to 60 years. The commonest age groups of the cases were in 4th and 5th decade. The youngest patient is 18 years old and oldest patient is 72 years old. These is a predominant right side involvement. The modes of injury in most cases is fall from height (88%) followed by RTA (12%). Commonest radiological types of fracture are sanders type II and type III. There were 4 complications, 3 cases had deep wound infection and 1 case improper reduction follow up period was between 6 weeks to 2years. Results were fair in 6 patients, good in 20 patients and 4 cases had poor results.

Conclusion

In conclusion, open reduction and internal fixation with locking calcaneal plate gives a good functional outcome, manifested by restoring anatomical reconstruction of height, width, principles are strictly adhered to, proper patient selection, appropriate timing for surgery, strict asepsis, proper approach for raising full thickness flaps and accurate anatomic reduction and proper postoperative protocol are followed. We suggest a multi centric randomized control trial to prove the superiority in long term follow-up and evaluations of newer modalities with use of bioabsorbable screws, minimal invasive surgeries and bone cements that appear promising in short term studies.

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